

**Blower for a Vacuum Cleaner***Inv. air*

5 The subject of the invention relates to a blower for a vacuum cleaner consisting of an electric drive motor and a support cage for receiving structural modules of the drive motor, such as stator pack, rotor and brush holder with carbon brushes as well as an at least single stage blower unit driven by the motor and having a deflector, an impeller and suction hood, the  
10 deflector being at the same time structured as a lid for the support cage and providing a bearing seat for the rotor.

*2. The State of the Prior Art.*

A vacuum cleaner blower of this type is known, for instance, from German patent specification DE-AS 15 63 028.

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The prior art device is provided with a support cage made of an insulating material for receiving structural electrical modules of the motor, such as stator pack, rotor and brush holder for carbon brushes, and, at its bottom, with a bearing seat for the bearing of one of the two rotor bearings.  
20 Laterally of the rotor bearing the support cage is provided with two brush holders for the collector carbon brushes. In the wall of the housing or cage there are also provided recesses for directly receiving electrical connectors. The open side of the support cage facing the blower is structured as a centering rim for a deflector enclosing the support cage and supporting a  
25 second rotor bearing. In this support cage, the brush holders provided in the lower section of the housing and the plastic support cage form an integral unit. However, the carbon brushes of the rotor aligned transversely of the vertical axis of the support cage have to be connected, as well as inserted, from the outside. Accordingly, the assembly of the known suction blower suffers  
30 from the drawback that during assembly of the suction blower the insertion and connecting devices have to be changed several times. Accordingly, it is

not possible to realize a cost-efficient and fully automatic simple fabrication and blower assembly process. Thus, in the prior art the necessary securing of the stator pack by means of screws inserted through the support cage wall necessitates a change in direction during assembly such that the required  
5 assembly tool has to be withdrawn to the outside before the rotor can thereafter be inserted into the support cage in the preferred assembly orientation and direction of mounting. The same drawback exists in connection with the assembly and connection of the carbon brushes.

*OBJECT OF THE INVENTION*

10 It is an object of the invention ~~so~~ to structure a support cage so as to enable a simple cost-efficient assembly of the various structural modules of the suction blower without changes in the mounting direction and automatic contacting of the electrical connections of the motor, such as carbon brushes, winding connectors, etc., during assembly of the structural modules in the  
15 support cage.

*SUMMARY OF THE INVENTION*

The object is accomplished by the characteristics defined in patent claim 1. Advantageous embodiments and improvements of the invention are set forth in the ensuing sub-claims.

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The essential advantage obtained by the invention is that for finalizing the suction blower in a preferred assembly and mounting direction, all essential structural modules required for the operation of the electric motor aggregate, such as stator assembly, rotor, rotor bearing as well as brush  
25 holder with carbon brushes, may be automatically and successively inserted from the upper side of the support cage, and secured in their proper orientation, within the support cage, without additional fasteners. During assembly, without changing the assembly direction, the electrical connections of the stator and the rotating rotor are contacted directly by way of the carbon  
30 brushes. The inventive structure of the support cage for arranging and accommodating the brush holders of the carbon brushes near the upper side

of the cage facing the deflector as well as the special configuration of the support cage for the stator with connectors and the electrical contacts facilitate the advantageous simple assembly of the suction blower. Moreover, as distinguished from the prior art, it is also possible to arrange electrical components necessary for protecting the windings and/or motor in the support cage. The motor may also be equipped with electronic components in the preferred assembly and mounting direction, simply and automatically.

*DESCRIPTION OF THE SEVERAL DRAWINGS*

An embodiment of the invention is schematically depicted in the and will be described in greater detail hereinafter. In the drawings:

- Figure 1 is a perspective view of a suction blower for a vacuum cleaner;
- Figure 2 is an exploded view of the structural modules of the suction blower in the sequence of their assembly;
- Figure 3 is a perspective view of a support cage of the suction blower;
- Figure 4 is a perspective view of the support cage with the stator assembly, rotor and brush holder with carbon brushes mounted therein;
- Figure 5 is a perspective view of the support cage with the deflector of the blower unit mounted therein;
- Figure 6 is a top elevation of the support cage with a separate receptacle on the support cage for an adaptor housing for receiving a circuit board including electrical components for the drive motor of the suction blower;
- Figure 7 is a front elevation of the support cage including the adaptor housing and circuit board arranged, in the assembly direction, above the receptacle;
- Figure 8 is a top elevation of the support cage corresponding to Fig. 6 with the inserted adaptor housing;
- Figure 9 is a perspective view from below of the support cage;
- Figure 10 is a side elevation of a circuit board equipped with electrical

components, for the adaptor housing; and

Figure 11 is a view, in longitudinal section, of the adaptor housing.

*DESCRIPTION OF EMBODIMENT*

In Fig. 1, 1 denotes a suction blower for a vacuum cleaner (not shown),  
5 the aggregate consisting of an electric drive motor 2 and a blower unit 3  
driven by the motor. The blower unit 3 is covered by a suction hood 4  
provided with a suction opening 5 for the flow of suction air. The sucked in air  
permeated the drive motor 2 and exits at the rear of the motor from a support  
cage 10. As shown in Fig. 2, the support cage 10 receives the known  
10 structural modules of the drive motor 2, such a wound stator assembly 6, a  
rotor 7 and brush holders 8 with carbon brushes 9. The blower unit 3 is of the  
single stage type and consists of a deflector 11 provided below the suction  
hood 4, and an impeller 12. The deflector 11 also serves as a cover for the  
drive motor 2 in the support cage and is provided with a bearing or bearing  
15 seat 13 (side B of the support cage) for the rotor 7. The other bearing seat 14  
for the rotor 7 is provided in the bottom 15 of the support cage 10 (see Figs.  
1, 2, 5) defined as side A of the support cage. In the embodiment shown, the  
bearing seat 14 is arranged in a cruciform bracket 23 formed in the bottom 15  
of the support cage for realizing the exits for the suction air flowing through  
20 the motor. Of course, the cruciform structure of the bracket is not mandatory.  
Any other structure may be provided as suction air exits, such as an enclosed  
cage bottom provided with laterally formed air slots.

Fig. 2 is an exploded view of the structural modules of the suction  
25 blower 1 in the sequence of their assembly. To this end, the support cage 10  
is structured, in accordance with the invention, for a mounting direction (arrow  
C) of its structural modules in the axial direction of the aggregate, as well as  
for direct contacting. To this end, the brush holders 8 of the carbon brushes 9  
are provided adjacent to the upper side B of the support cage which faces the  
30 deflector 11.

At its side facing the deflector 11 the support cage 10 is formed to have an outwardly flared rim. The flared rim 16 is provided with receptacles 17 which are open in an upward direction and in the direction of the support cage 10 (see Figs. 2 to 5), into which the brush holder 8 of the carbon brushes 9 may be placed from above. Furthermore, opening 18 are provided in the rim 16 (Figs. 2 to 4) and extending into the wall 19 of the support cage 10. This structure allows insertion from above into the support cage 10 of the stator assembly 6 as well with its connections 20 extending beyond the support cage wall 19 and in contact with the control electronics (not shown) of the motor. Insertion of the brush holder 8, by direct contact of the brush holder contact pins 21 (Fig. 4) with the stator contacts 20, provides an electric connection between the rotor 7 and the stator.

Following assembly of the structural components of the drive motor, the support cage 10 is closed and centered by, and screwed to, the deflector 11 serving also as a lid or bearing shield for the second rotor bearing. For aligning the support cage 10 and the deflector 11 relative to each other one or more centering guides 22 which positively engage each other, are respectively formed in the flared rim 16 of the support cage 10 and in the marginal area of the underside of the deflector 11. The centering guides 22 may be pins, profiled protrusions, bores or the like.

It is of particular advantage to form the centering guides 22 with a profile, for instance a U-shaped profile, as shown in Figs. 2 and 5, which fits precisely into the receptacles 17 of the brush holders 8 in the support cage 10. On the one hand, this causes the deflector 11 to be precisely centered during assembly of the suction blower 1 and, on the other hand, the brush holders 8 and carbon brushes 9 are securely set to allow for an optimum direct contact. Such centering guides 22 additionally serving as hold downs for the carbon brushes 9 eliminate the need for screwed connections and simplify the assembly operation.

As shown in Figs.3 and 4, support braces 24 or receptacles 25 complementing the contour of the stator assembly 6 are integrally formed in the support cage 10 for securely receiving and supporting the stator. The cruciform bracket 23 at the bottom 15 of the support cage formed by the air vents in the wall 19 of the support cage is provided with the second rotor bearing 14. The support cage 10 and the deflector 11 as supports for the rotor bearings are made of a non-conductive material, in particular a plastic. The insulating plastic allows mounting of the electrically conductive brush holders 8 without additional measures of insulation.

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As shown in Fig. 2 assembly of the suction blower 1 is carried out from above in the preferred direction C of mounting. As it requires no change in direction, the assembly may be carried out fully automatically. The arrow marks the direction in which the individual structural modules of the blower are successively put together in individual assembly steps. Initially, a ball bearing balancing disk (not shown) is assembled into the bearing seat 14 in the bottom 15 of the support cage 10. Thereafter, the stator assembly 6 is inserted into the cage, and it is centered and secured therein by the support abutments (Fig. 3) as well as by the interior shape of the support cage 10 conforming in its contour to the stator assembly 6. After insertion of the wound stator assembly 6, the rotor is inserted followed by the mounting of the brush holders 8 and its carbon brushes 9. During their placement, the carbon brushes 8 insulated in their receptacles 17 of the plastic support cage 10 directly contact the connectors 20 of the stator pack by way of their brush holder connector contacts 21. Accordingly, the electrical connection between the rotor 7 and the stator is established as soon as the brush holder 8 are inserted. Thereafter, the deflector 11 is mounted as the closing element of the support cage 10 and is secured to the support cage 10 by a screw connection 28. The deflector 11 is affixed to the flared rim 16 in a centered orientation. This connection causes the structural modules of the drive motor 2 to be centered automatically and secured within the cage ensuring, at the

same time, the direct contact. During its assembly, the deflector 11 and its integrated bearing seat 13 receives the second rotor bearing. Thereafter, mounting takes place of the impeller 12 and of the suction hood which, secured to the support cage 10 encloses the blower unit 3 toward the exterior. Even during this assembly operation, the direction C of mounting, Fig. 2, in the axial direction of the suction blower 1 can be maintained.

Electric components for switching, control and/or safety features needed for the suction blower drive motor 2 may be advantageously arranged within the support cage 10 as a result of the special structure of the support cage 10. At least one further receptacle 27 (see Figs. 6 to 9) is provided in the flared rim 16 of the support cage 10 for receiving electric components 28. The electric components are arranged on a circuit board 29 or platen which preferably also supports the connection pins 30a, 30b for direct connections (see Fig. 10).

During assembly, the circuit board 29 is inserted separately into the receptacle 27 or, as provided in the embodiment, such a circuit board 29 is inserted into a separate adaptor housing 31 (see Figs. 7, 8, 11) which is then inserted into the receptacle 27. At its bottom, the receptacle 27 formed in the wall of the support cage (Fig. 9) is provided with a socket 32 for an external connection to a net. The socket opening 32 extends the wall 19 of the support cage 10 in an axial direction.

The adaptor housing and complementing circuit board 29, or the circuit board as such, is provided with the mentioned connector pins 30a, 30b which, for establishing a direct contact, are disposed in an axial direction of the support cage 10. The connector pins 30a, 30b are preferably mounted on the circuit board 29. Following assembly of the blower, the connector pins 30b are needed for a connection with the external net socket connection.

When mounting the adaptor (mounting direction C) first contact pins

30a of the adaptor housing 31 or of the circuit board 29 will connect to associated contacts 20 of the stator pack. The remaining connector pins 30b for external net connection extend freely into the socket opening 32.

Preferably, mounting of the adaptor housing 31 and associated circuit board  
5 29 preferably takes place after insertion of the stator 6 into the support cage 10.

The adaptor housing 31 and the electric components 28 on the circuit board 29 may be fitted positively into the receptacle 27. In the simplest case,  
10 the electrical components 28 on the circuit board 29 include a decoupling capacitor for the suction blower drive motor 2 as well as a thermal switch for the protection of the windings and/or motor. It is also possible optionally to provide electric power switches, or to arrange them in an addition receptacle.

As shown in Figs. 8 and 11, there is provided at the adaptor housing 31  
15 a hold down bracket 33 for the stator assembly 6 which as shown in Fig. 8 holds down and secures the assembled stator pack 6 once the deflector 11 has been mounted. Thus, the stator pack 6 is secured from above against axial displacement by its engagement with the adaptor. As shown in Fig. 11,  
20 the adaptor housing 31 consists of a lower housing portion 31a for receiving the circuit board 29 and a lid portion 31b pivotally connected to the lower housing portion 31a. When the adaptor is mounted the lid portion 31b is flush with the flared rim 16 and positively seated in the receptacle 27. The lid portion 31b is connected to the lower housing portion 31a by a flexible joint.

25 The preferred direction for fully automatically assembling and mounting the suction blower may be maintained even for the adaption of the support cage to electrical components required for the protection of the windings or the motor.

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